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SOME TYPES OF SILOS AND EQUIPMENT

W. A. LINKLATER

In past years almost every conceivable type of silo has been tried, and the fact that after these years of experience nine out of every ten silos built in this country are round in shape, strongly argues that the circular type of silo is best. In this circular only round silos will be discussed.

The proper size and dimensions to build a silo will depend upon the number of live stock to be fed and the number of days they will need feed. Ordinarily the height is about twice the diameter. At least two inches of silage should be removed from all over the top surface of the silo every day, so the diameter of the silo should be proportionate to the number of stock to be fed. If two inches of silage is removed each day the depth of silage will determine the number of days that the feed will last. At this rate of feeding thirty feet of silage would last 180 days. The figures given in the following table are based on a feed period of 180 days, feeding forty pounds per head per day. The relationship of the height of a silo to its capacity should be noted:

Height Feet.	Diameter Feet.	Number of Cows Cattle.	Capacity in Tons.	Approximate Acres.
20	10	8	30	4
20	12	12	45	6
24	12	16	55	8
24	14	19	73	10
30	12	21	80	10½
30	14	28	95	13
30	16	32	120	16
30	18	40	150	20
36	16	40	150	20
36	18	50	190	25
36	20	64	235	32

The most essential features of a silo are that it be air-tight, durable, and stand firmly. In order that the silo be air-tight and keep silage well the inner surface of the walls must be perpendicular and smooth to allow perfect settling of silage, and must also be strong enough so as not to bulge from the weight of silage.

Whatever material is used in the construction of a silo, whether wood, brick, or concrete, it is recommended that a concrete foundation be built extending three feet into the ground and at least one foot above the ground. It is economical and advisable to excavate three feet deep for the silo, as three feet in depth is thus added cheaply. The following plan of laying out a silo and of building the concrete foundation is recommended:

A stake should be driven into the ground in the center of the proposed silo and saw off squarely at the height to which it is planned to have the concrete foundation come. To the top of this stake, fasten a 2x4 scantling, a little longer than half the diameter of the proposed silo, with a spike or bolt in such a way that the scantling may be moved around to mark off the silo circle as indicated in Figure 1. Having thus laid off the silo, the 2x4 scantling should be removed

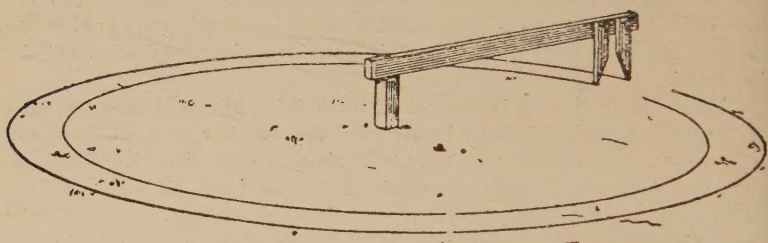


Figure 1. Laying off Silo.



Figure 2. Trench dug for foundation.

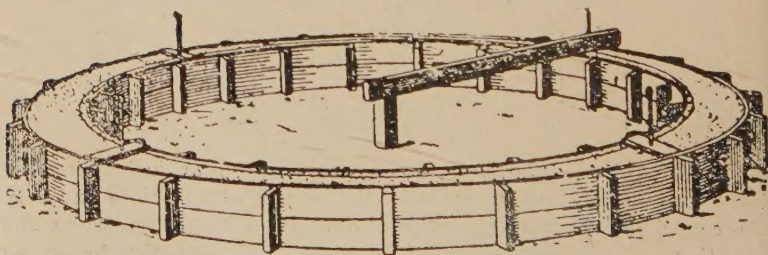


Figure 3. Foundation wall.

and a trench dug for the foundation to the depth desired as shown in figure 2. The inside of the ditch wall should be perfectly plumb.

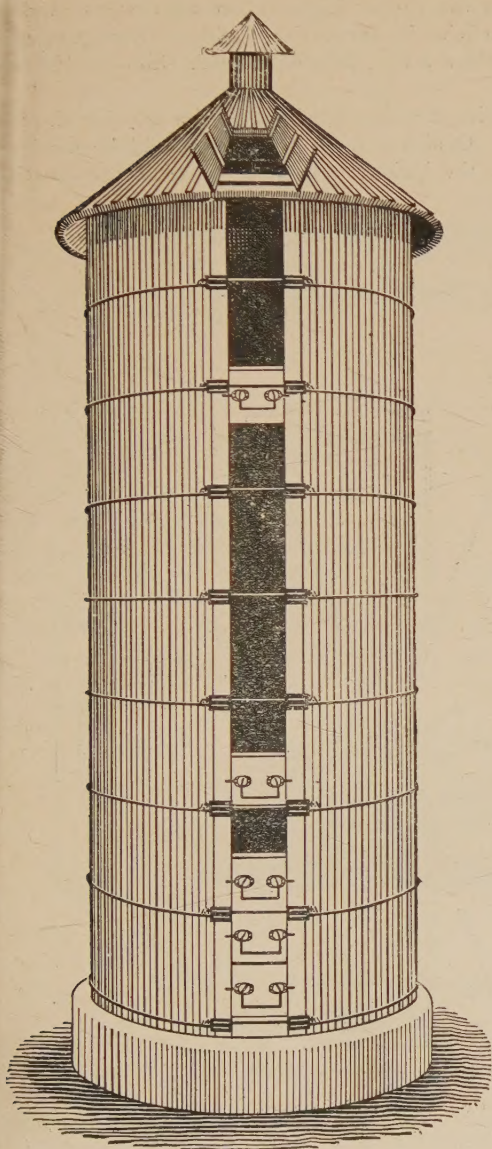


Figure 4. Type of patent stave silo showing continuous doorway.

Do not remove any of the dirt from the center at this time. The concrete for the foundations should be made of one part cement, three parts sand, and five parts broken rock, and the ditch filled to the surface of the ground. In constructing a form for the concrete wall above the ground, drive 2x4 stakes one-half inch from the foundation, both inside and outside, and two feet apart all the way around, as shown in Figure 3. Half-inch lumber may be bent around on the inside of these stakes. The top of this form must be made exactly level. When the foundation wall has been completed and is set, dig out the earth in the center to the depth of the foundation wall and if desired lay a concrete floor. The chief advantage of such a floor is in preventing rats from getting in and burrowing through the silage and causing much of it to spoil.

A continuous doorway, as shown in Figure 4, has many advantages and should be used where possible.

The doors need not be made as in Figure 4, but may be of any type

that can be readily removed, and that are tight enough to exclude air.

A roof is not necessary to the preserving of the silage. A roof, however, may strengthen the silo or improve the appearance, and in some cases may be beneficial in preventing damage from excessive rains. Figure 5 indicates how a roof may be framed. Figure 12 shows another type of roof.

Paint will not only improve the appearance of a wooden silo but will help to preserve it. Ordinary outdoor paint should be used on the outside wall, but for the inside some kind of wood preservative paint is recommended.

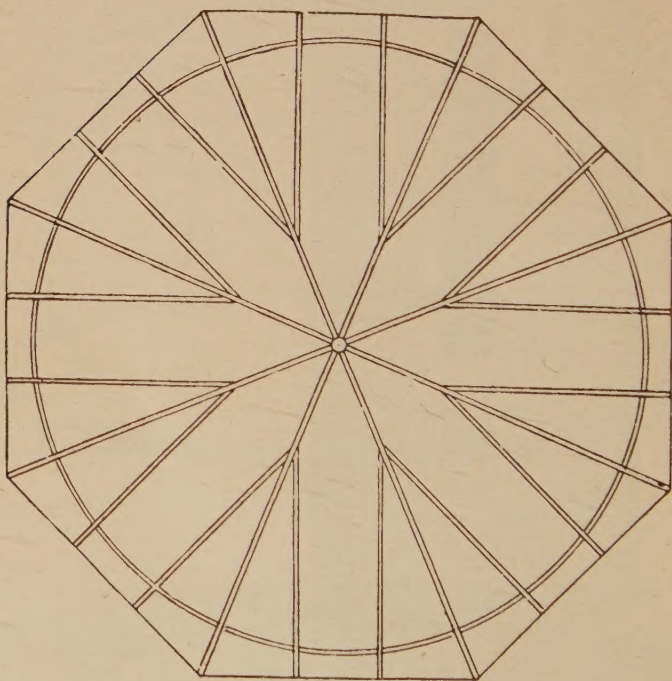


Figure 5. Plan of roof frames.

Wooden Silos.—There are many different types of round silos made of wood. One of the most common, because it is easily erected and low in price is the stave silo. Figures 4, 9 and 10 show different types of patent stave silos. Home-made stave silos may be comparatively easily constructed. It is well to use sized, tongued and grooved or one-piece staves, free from dead knots. When one-piece staves cannot be secured, spliced staves may be used. Figure 6 indicates a simple method of splicing. A piece of heavy sheet iron is fitted into saw cuts in the stave ends and holds the joint securely.

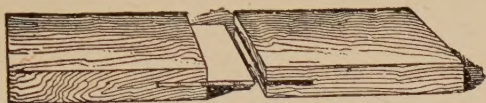


Figure 6. Stave splice.

The hoops for the stave silo may be made of half-inch or five-eighths-inch round iron, depending on the size of the silo. Each hoop should be in three pieces. These pieces are held together by lugs of a type similar to Figures 7 or 8. Each end of each piece of hoop rod should have at least six inches of thread to permit sufficient tightening of the silo. A good plan is to make the continuous door-frame of 4x6's. This door-frame should be about two feet wide and fastened together by rods of a similar size to the hoops. The hoop ends should pass through this door-frame from either side, and have on these ends not less than six inches of thread. When the silo is first erected, all the tightening should be done at the lugs around the

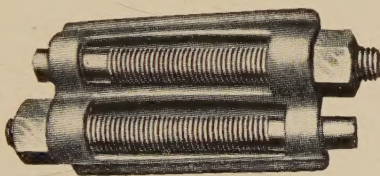


Figure 7. Malleable iron lug.



Figure 8. Cast iron lug.

walls of the silo. Later, when wishing to tighten the silo, which has dried out after being emptied, the tightening may be easily done at the doorway. Precautions must always be taken to keep the silo's hoops tight. Figure 9 shows a silo, evidently partially emptied, with the hoops sagging down. If stave silos are to stand firmly under

Oklahoma conditions, where they seldom can be firmly attached to adjoining buildings, they must always have the hoops tight and be well anchored. Six wooden stave silos were built in Payne County last summer, and they have all blown down this spring. These silos were well built and anchored, but the hoops were not kept tight and the staves collapsed inward during high winds. One of these silos is shown in Figure 10.

The reason for advising that provision be made for tightening of the silo at the door-frame is that it is much more conveniently and quickly done at that point. Where the lugs are distributed at different

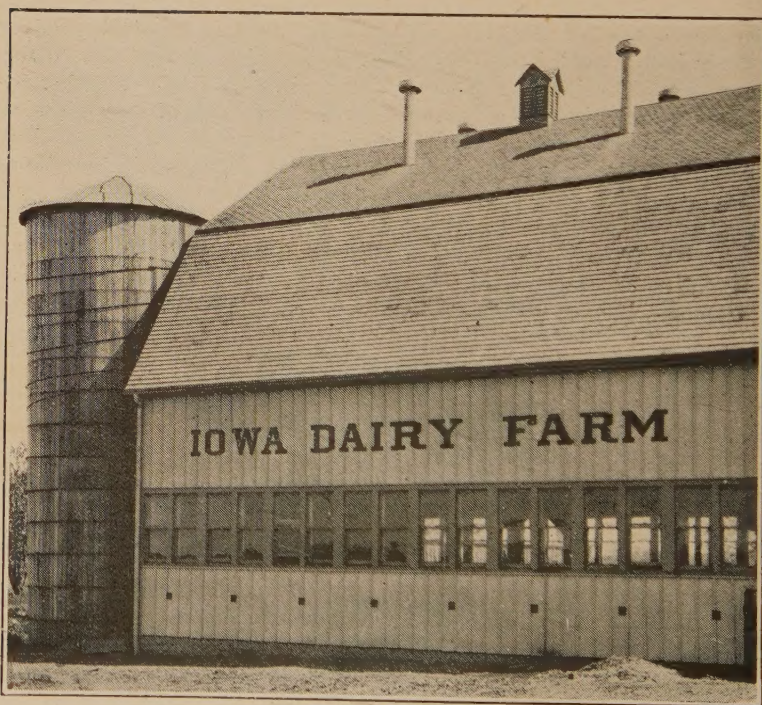


Figure 9. Silo with loose hoops.

points on the wall, as in the silo shown in Figure 10, it is a slow and dangerous job to tighten the rods at these points by means of a ladder, and will generally be neglected until too late.



Figure 10. Patent stave silo.

Figure 11 shows what is known as a wooden-hoop silo. The hoops are made of several thicknesses of half-inch lumber, preferably green hardwood, using a form in their construction so that all are the same size. After these hoops have been placed in position by means of staging, inch lumber is nailed to them up and down. Inside of this



Figure 11. Wooden hoop silo.

one or two thicknesses of building paper is tacked, then half-inch lumber. The half-inch lumber may be put on round and round or up and down. Once built and well anchored such a silo needs little attention or repairs.

Figure 12 shows an unfinished "King" silo. The frame of this



Figure 12. Unfinished "King" silo.

silos is made of 2x4's on 16-inch centers. On the inside are two thicknesses of half-inch lumber with building paper between. Siding and paint on the outside would much improve its appearance.

Figure 13 shows the A. & M. College dairy barn and the concrete silo. This silo is 15 feet in diameter on the inside and 32 feet high. The wall is 7 inches thick at the base and 5 inches thick at the top. As many iron rods or hoops are built into the concrete to reinforce it as would be necessary for a wooden stave silo. Metal reinforcement is absolutely necessary as the concrete wall, without such reinforcement, will not stand the pressure of the silage without cracking.



Figure 13. A. & M. College dairy barn and concrete silo.

Wire may be used instead of iron rods. Both the inner and outer surfaces of the silo walls should be given a smooth, close finish, either by troweling while the concrete is still green or by applying a coat of strong cement plaster, as otherwise there is apt to be a certain amount of spoiled silage around the wall.

Figure 14 shows a concrete block silo. A special type of block is necessary in building round silos. Block silos need just as much metal reinforcement as the silos with solid concrete walls. The type of door used in this silo can be seen in the upper left-hand corner.

A continuous doorway of the type recommended for stave silos can be used in either concrete or concrete block silos to advantage.

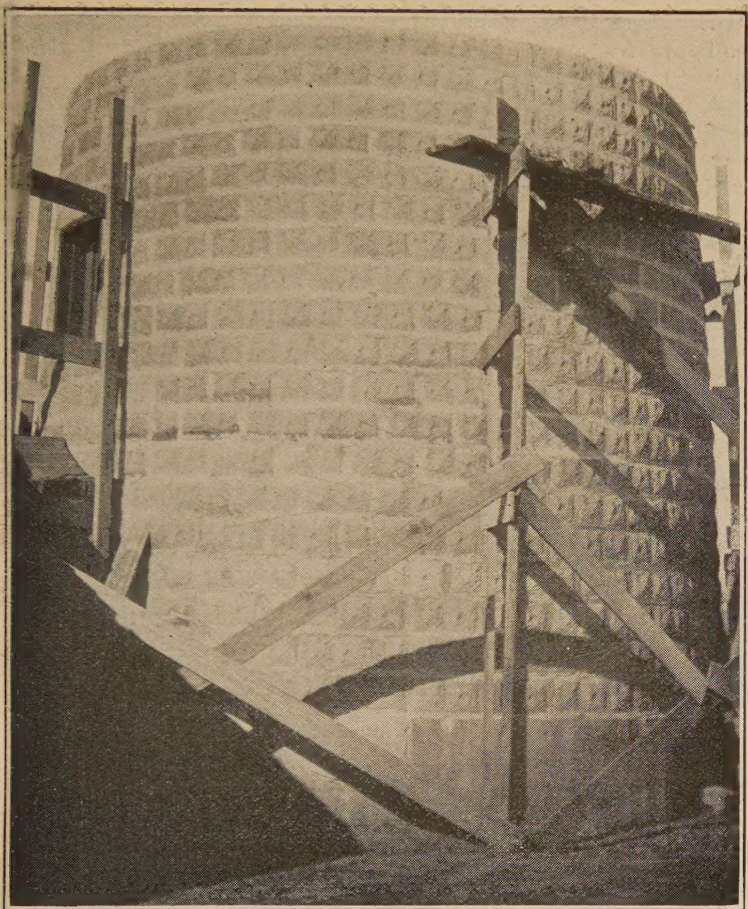


Figure 14. Concrete block silo.

Figures 15 and 16 show two different types of ensilage cutters. No. 15 has the knives and blower fans attached to the flywheel, while in No. 16 cylinder knives are used and the blower is a separate machine. These machines have a capacity of 12 to 15 tons of corn per hour and require 10 to 12 horsepower to drive. They will elevate the cut corn 40 feet. Blowers are much more satisfactory elevators than carriers.

Ordinarily it is most economical to rent a steam engine to furnish power for the ensilage cutter. The engine should be of twelve horsepower or more.

A corn binder saves considerable hard labor in handling the corn,

particularly in unloading the corn from the wagons to the ensilage cutter. There is the additional advantage of having uniform sized bundles to feed to the cutter. At least two corn binders will be required to keep a large ensilage cutter going.

A full equipment of silage machinery is fully as expensive as a good silo, and since such equipment would be sufficient for filling six or more silos, there is great economy in a number of silo owners combining in the purchase of silo filling machinery.

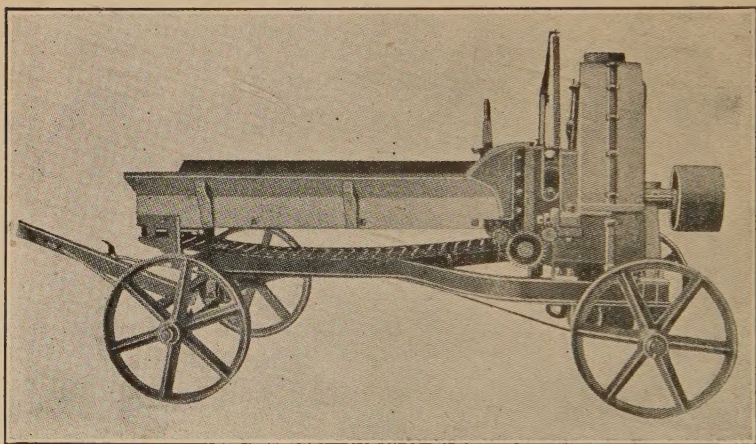


Figure 15. Ensilage cutter with blower combined.

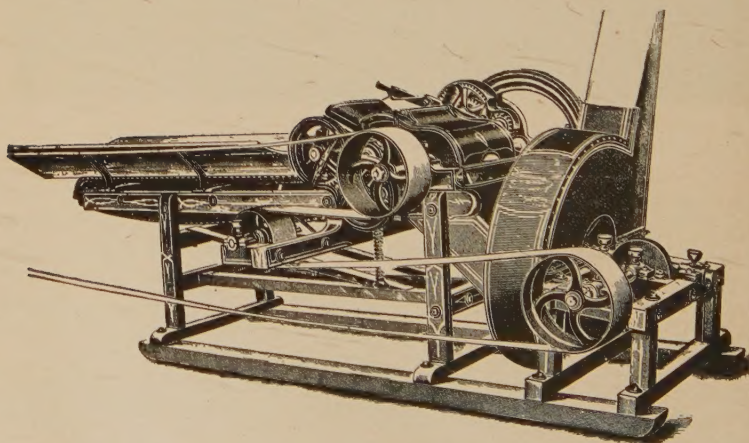


Figure 16. Ensilage cutter with separate blower.

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- No. 45—A Catalog of the Ferns and Flowering Plants of Oklahoma.
- No. 46—Digestion Trials.
- No. 58—Fattening Steers; Using Cottonseed, Cottonseed Meal, Wheat Meal, Wheat Straw and Hay.
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- Circular No. 11—The Cattle Tick.
- Circular No. 15—Some Types of Silos and Equipment.
- Fourteenth Annual Report.
- Fifteenth Annual Report.
- Sixteenth Annual Report.
- Eighteenth Annual Report.

